The Association of Body Mass Index (BMI) and Radiographic Progression of Joint Disease in Rheumatoid Arthritis (RA)

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Background: Previous studies suggest that lower BMI is associated with progression of radiographic joint damage in RA but little is known about the biological role BMI plays in radiographic joint damage and research outcomes of the association have varied. Whether the association of BMI and radiographic joint damage may be mediated by disease activity variables is currently unknown. Using a cohort of RA patients, this study aims to examine the relationship between BMI and radiographic joint damage and disease activity.

Methods: We analyzed data from a longitudinal RA cohort study. The data collection included joint examinations, blood draws and patient reported outcome measures over 10 years. Hand and wrist radiographs were acquired at baseline and 2 years and scored by the van der Heijde-modified Sharp score (vdHSs) (n=543). We created a dichotomous outcome variable for radiologic progression; defining patients with radiographic progression as having a change of ≥ 10 units in total vdHSs over two years. We conducted univariate analyses to assess predictors of radiographic joint damage progression that included age, gender, BMI group (underweight BMI <20kg/m2, normal BMI 20-24.9 kg/m2, overweight BMI 25-29.9 kg/m2, obese BMI ≥30kg/m2 (Baker et al, 2011)), DAS28-CRP4, and anti-CCP status. For our primary analysis, we constructed a multivariate logistic regression model to study the effect between BMI and radiographic progression.

Results: We studied 543 patients with a mean age of 57.6 (12.7) years and a mean disease duration was 14.4 (12.2) years. Eighty-three percent were female and 68.3% were anti-CCP+; 69 (12.7%) of the patients had progression of joint damage. In the univariate analysis, gender, age, BMI (group), anti-CCP+, and DAS28-CRP4 were all associated with radiographic joint damage. The multivariate logistic regression analyses showed that patients who were underweight or normal weight had a significantly increased odds (OR=4.85, 95%CI 1.76-9.05; OR=3.99, 95%CI 1.76-9.05) of having radiographic progression compared to patients who were obese. Having a higher DAS28-CRP4 score was associated with greater odds of having radiographic joint damage (Table).

Conclusions: We found that lower BMI was associated with radiographic joint damage progression in RA, independent of disease activity. Further work is necessary to understand the biological role BMI plays in radiographic joint damage progression, as well as the involvement of inflammation in the relationship between BMI and progression of joint disease in RA.

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| Association of BMI and radiologic progression of joint disease in RA | | |
| Multivariate Logistic Regression Model\* | Odds Ratios | Confidence Intervals |
| **BMI (underweight vs. Obese)** | **4.85** | **1.34-17.53\*\*** |
| **BMI (Normal vs. Obese)** | **3.99** | **1.76-9.05** |
| BMI (Overweight vs. Obese) | 1.65 | 0.68-4.02 |
| **DAS28-CRP4 (continuous)** | **1.28** | **1.08-1.51** |
| Anti-CCP Positive | 1.85 | 0.96-3.57 |
| \*adjusted for age and gender  \*\*test for trend of BMI group and radiologic progression p=0.0006 | | |